MAP DISTRIBUTION SYSTEM AND

TERMINAL DEVICE USED IN THE SAME

The present disclosure relates to the subject matter

5   contained in Japanese Patent Application No. 2002-269168 filed

September 13, 2002, which is incorporated herein by reference

in its entirety.

BACKGROUND OF THE INVENTION

10   Field of the Invention

The present invention relates to a map distribution system

used for a navigation terminal or the like that is mounted on

a vehicle and its terminal device.

15   Background Art

A car navigation system mounted on a vehicle as a typical

mobile body serves to display a map on display means on the

basis of the measured current position of the vehicle and display

a mark showing the current position of the vehicle on the map

20   in a superimposed manner.

In the car navigation system, measuring means for measuring

the current position of the vehicle comprises a GPS (global

positioning system) receiver or a self-contained navigation

sensor for calculating the current position from the travel

25   distance and the advancing direction of the vehicle or the like.

Further, map information for displaying the map on the display means, accompanying information accompanying the map information and various kinds of functional services are adapted to be provided from an information center located outside the vehicle by using communication means mounted on the vehicle.

As described above, in the car navigation system, the latest map information can be obtained from the information center located outside the vehicle by using the communication means mounted on the vehicle.

However, in order to obtain the latest map information, it is expected that a communication cost for using the communication means be generated.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a terminal device in a map distribution system in which a wasteful map transmission is prevented from being received and the transmission of map information is efficiently received so that a communication cost can be suppressed.

To achieve the object, the invention provides A terminal device in a map distribution system, including: a communication unit configured to transmit information to an information center and to receive information from the information center; a map storing unit configured to store map information received by the communication unit; and a control information storing unit

configured to store control information associated with the map information and received by the communication unit; wherein the control information is transmitted to the information center every prescribed timings; the communication unit receives latest control information which the information center transmits in response to the transmitted control information; and the control information stored in the control information storing unit is rewritten to the latest control information.

The invention provides a map distribution system, including: an information center that stores the latest map information; and a terminal device including a communication unit, a map storing unit, and a map storing unit; wherein the communication unit transmits information to the information center and receives information from the information center; the map storing unit stores map information received by the communication unit; the control information storing unit stores control information associated with the map information and received by the communication unit; the terminal device transmits the control information to the information center every prescribed timings; the information center transmits the latest control information to the terminal device in response to the control information transmitted from the terminal device; and the terminal device rewrites the control information stored in the control information storing unit to the latest control information.

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The invention provides a computer program product in a terminal device of a map distributing system, including: means for storing map information; means for storing control information associated with the map information; means for transmitting the control information to an information center every prescribed timings; means for receiving latest control information which the information center transmits in response to the transmitted control information; and means for rewriting the stored control information to the latest control information.

The invention provides an updating method of map control information for a terminal device in a map transmitting system, wherein the terminal device includes: a measuring unit for measuring and determining the current position of a vehicle, a communication unit for transmitting information to and receiving information from an information center, a map storing unit for storing map information received by the communication unit, and a control information storing unit for storing control information associated with the map information received by the communication unit, the updating method including: transmitting the control information stored in the control information storing unit to the information center every prescribed timings, receiving latest control information transmitted from the information center; and rewriting the

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control information stored in the control information storing

unit to the latest control information.

BRIEF DESCRIPTION OF THE DRAWINGS

5   The present invention may be more readily described with

reference to the accompanying drawings:

Fig. 1 is a block diagram of an embodiment of the present

invention.

Fig. 2 is a conceptual view showing the structure of map

10   information according to the embodiment of the present

invention.

Fig. 3 is a view for explaining a scale of the map information

according to the embodiment of the present invention.

Fig. 4 is a view for explaining a control method of the

15   map information according to the embodiment of the present

invention.

Figs. 5A-5C are views showing map control information

according to the embodiment of the present invention.

20   ## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, an embodiment of the present invention will be

described by referring to Fig. 1. The embodiment shown in Fig.

1 is an embodiment when a map distribution system and its terminal

device are employed in a navigation system used for a vehicle.

25   In Fig. 1, reference numeral 10 is a navigation terminal

mounted on a vehicle side as a mobile body. The terminal device
in the map distribution system of the present invention is
mounted therein to transmit and receive, update and control
a map. The navigation terminal 10 includes a display unit 11,
a communication unit 12, a control unit 13 which functions as
display control means for controlling the display unit 11,
functions as connection control means for controlling the
communication unit 12, and further functions as below-described
map control information updating means and map updating means,
a measuring unit 14 for measuring the current position of the
vehicle and an operating unit 18 for inputting the designation
of a destination or a command for executing a search for a route
by a user. Further, the communication unit 12 includes a data
processing part 15 for processing transmitted and received data
and a transmitting and receiving part 16 for transmitting and
receiving data.

Reference numeral 20 shows the structure of an information
center side. The information center 20 includes a center
communication unit 21 for performing a communication with the
communication unit 12 mounted on the vehicle side and in which
map information, service information and the map control
information of each map information are stored. Further, the
information center includes a storing unit 23 in which traffic
information including the delay information, the regulating
information or the accident information of roads, weather

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information including the present weather or the weather forecast of each area and various kinds of information of real time such as event information held at the present time or in future in each area are stored to so as to be accumulated.

5   Further, the information center includes a center control unit 22 which functions as a center communication means control part for controlling a communication by the center communication unit 21, functions as a read control part for controlling the reading operation of various kinds of information from the

10   storing unit 23 and further functions as a calculating part for calculating the travel route of the vehicle.

As described above, in the navigation system comprising the navigation terminal 10 and the information center 20, the map distribution system of the present invention is used.

15   Various kinds of request commands are transmitted from the navigation terminal 10 to the information center 20 via a line for connecting the communication unit 12 to the center communication unit 21. Various kinds of information corresponding to the commands are transmitted to the navigation

20   terminal 10 from the information center 20.

As a construction to be used as the line for connecting the communication unit 12 to the center communication unit 21, a portable telephone service system and a PHS telephone service system can be used. Further, as one example of the request

25   commands transmitted to the information center 20 from the

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navigation terminal 10, a variety of information obtaining commands or function commands mounted on a usual navigation system may be exemplified. These commands include a map request command for obtaining the map information, a route calculation

5   request command for calculating a travel route, a search request command for searching for facilities or spots, an information request command for obtaining various kinds of information such as traffic information, etc.

Here, the map request command in the navigation system

10   including the map distribution system will be described in detail. The control unit 13 outputs map request information including present position information based on the present position of the vehicle measured by the measuring unit 14 and map reduced scale information or the like to the data processing part 15.

15   After each information is converted to a prescribed form in the data processing part 15, the information is transmitted to the information center 20 through the transmitting and receiving part 16 as the map request command.

In the information center 20, the center control unit 22

20   reads the map information from the storing unit 23 based on the map request command obtained via the line for connecting the communication unit 12 to the center communication unit 21. Then, the center control unit 22 transmits the read map information to the navigation terminal 10 through the

25   above-described line 10.

Then, in the navigation terminal 10, a map is displayed on the display unit 11 based on the map information obtained by the communication unit 12 through the above-described line. The control part 13 includes temporary storing means 17 for

5   storing information and is adapted to store and hold below-described various kinds of information obtained from the information center 20 as well as the above-described map information, unless an erasing process is positively performed in accordance with an instruction of a user or the like.

10   In the navigation terminal 10, the map information received from the information center 20 is stored and accumulated in the temporary storing means 17 as described above so that a map data base can be constructed. Further, not only the map information received from the information center 20, but also

15   a prescribed amount of map information may be previously (upon manufacturing a device or the like) stored in the temporary storing means 17 to construct the map data base. Further, the previously stored map information may be added to the map information received from the information center 20 to construct

20   the map data base.

Now, a method for controlling and updating the map information relative to the map data base will be described in detail with reference to Figs. 2 to 5.

Initially, the structural concept of the map information

25   used in this embodiment will be described by referring to Fig.

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a indicates a basic map and b is a primary mesh, corresponds
to a range of a block of a geographical map of 1-200,000 and
a mesh having an area of about 80 km square as a leaf. c is
5   a secondary mesh, corresponds to a range of a block of a
geographical map of 1-2,5000 and a mesh having an area of about
10km square as a leaf. d indicates map information having
minimum units in which the second mesh is equally divided into
64 pieces to have an area of about 1.2 km square as one leaf.
10   In this embodiment, this minimum unit is a unit that can
be updated when the map information is updated. The information
center 20 updates the map to the latest data for each of minimum
units capable of being updated. For example, when a facility
or the like is newly constructed in the area of about 1.2 km
15   square, the map information of the minimum unit capable of being
updated in which the facility is included is updated in order
to add a mark or information showing the facility thereto.

Also as shown in Fig.3, the primary mesh b corresponds to
the range of the block of the geographical map of 1-200,000
20   and is the mesh having the area of about 80km square as one
leaf.

Further, the secondary mesh corresponds to the range of
the block of the geographical map of 1-2,5000 and is the mesh
having the area of about 10 km square as one leaf.
25   On the other hand, upon controlling the map information

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having the minimum unit capable of being updated (an area of about 1.2 km square) as one leaf, when a file is controlled for each leaf, the number of files becomes enormous. Therefore, a plurality of leaves (a plurality of meshes) is controlled

5   for files as one group. A manner thereof is shown in Fig. 4.

As shown in Fig. 4, the map information having 64 leaves (64 meshes) of the minimum units capable of being updated is determined to be one group, so that the map information of one group has the same area as one leaf (one mesh) of the secondary

10   mesh c. This one group is controlled as one secondary mesh file. Accordingly, a plurality of secondary mesh files in which the map information having 64 leaves (64 meshes) of the minimum units capable of being updated is determined to be one group is controlled.

15   The control method of the map is equal both in the navigation terminal 10 and the information center 20.

In Figs. 5A-5C, version lists as one of control information associated with the map information are shown. A terminal version list shown in Fig. 5A is stored in the temporary storing

20   means 17 in the navigation terminal 10. The terminal version list shows a list of the above-described secondary mesh file groups. File numbers and update dates thereof are listed.

Fig. 5B shows the latest center version list stored in the storing unit 23 in the information center 20. The latest center

25   version list shows a list of the above-described secondary mesh

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file groups and file number and update dates thereof are listed. These update dates indicate dates when the secondary mesh files of the map information stored in the information center 20 are updated. That is, when even one of the maps of the minimum units capable of being updated included in the secondary mesh file is updated, the update date of the map becomes the update date of the secondary mesh file in which the map is included.

The navigation terminal 10 obtains the latest center version list at intervals of prescribed timings from the information center 20 and rewrites the terminal version list already stored in the temporary storing means 17 to the latest terminal version list on the basis of the obtained latest center version list. For example, when the update dates of the secondary mesh files of numbers 63 and 64 shown in Fig. 5B are newer than the update dates of the secondary mesh files of terminal version list numbers 63 and 64 shown in Fig. 5A, the update dates of the secondary mesh files of the numbers 63 and 64 shown in Fig. 5B are recorded as the update dates of the secondary mesh files of the terminal version list numbers 63 and 64 shown in Fig. 5A.

In such a manner, the terminal version list is always made the latest. This terminal version list is referred to and compared with map updating list shown in Fig. 5C for controlling the map information stored in the temporary storing means 17 of the navigation terminal 10. Thus, the map information stored

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in the information center 20 can be compared with the map information stored in the navigation terminal 10 to decide which is newer or older.

For example, the navigation terminal 10 obtains the latest center version list shown in Fig. 5B and compares this version list as the terminal version list with the map updating list shown in Fig. 5C. At this time, the navigation terminal can detect that the map information stored in the information center 20 is newer than the map information stored in the navigation terminal 10 in respect of the map information controlled in the second mesh files of the numbers 63 and 64. On the other hand, as for other map information, the navigation terminal can detect that the map information stored in the navigation terminal 10 is not different from the map information stored in the information center 20.

On the basis of such detected results, the navigation terminal can obtain only the map information stored in the information center 20 which is newer than the map information stored in the navigation center 10 from the information center 20. Thus, the map information can be updated in the navigation terminal 10.

When the map information is actually updated, the map information is updated for each secondary mesh file unit in which the map information having 64 leaves (64 meshes) of the minimum units capable of being updated is determined to be one

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group.

[Modified Embodiment]

In the above-described embodiment, the list of the secondary mesh files includes the terminal version list and the latest

5   center version list. In addition thereto, the map information having the minimum units capable of being updated as a low-order level may be also listed to have likewise a terminal version list and the latest version list.

In this case, the terminal version list of as the list of

10 the secondary mesh files is initially compared with the latest center version list in the navigation terminal 10. · As a result, as for the secondary mesh files in the latest center version list newer than those of the terminal version list, the latest center version lists for map information having the minimum

15 units capable of being updated included in the files are obtained. Then, on the basis of the latest center version lists, terminal version lists for map information having the minimum units capable of being updated of the navigation terminal 10 are updated.

20 Thus, in the map information having the minimum units capable of being updated stored in the navigation terminal 10, only the map information having the minimum units capable of being updated which is newer than the map information stored in the navigation terminal 10 and stored in the information

25 center 20 is obtained from the information center 20. Then,

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the map information can be updated in the navigation terminal 10.

As described above, version information is prepared for each layered structure of a map corresponding to the scale of one leaf of the map information. Accordingly, the map information can be finely controlled and whether the map information is new or old can be recognized and information can be updated in an arbitrary layer.

In all the embodiments described above, a computer program may be formed and a computer may be realized to have the same functions by the computer program.